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TITLE: PLASMA PROCESSING APPARATUS

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ABSTRACT:

PROBLEM TO BE SOLVED: To provide a means for controlling the temperature of a semiconductor wafer at high speed and uniformly in a plane in large heat input etching processing.

SOLUTION: A plasma processing apparatus plasmizes a processing gas and subjects a sample W to be processed mounted on a sample table to surface treatment using the plasma. The plasma processing apparatus has a refrigerant flow passage 2 formed in the sample table and constituting an evaporator of a cooling cycle, and uniformly controls the in-plane temperature of the sample to be processed by controlling the enthalpy of the refrigerant supplied to the refrigerant flow passage 2 and thereby keeping the flow mode in the refrigerant flow passage 2, namely in the sample table, in the state of a gas-liquid two-phase state. If by any chance dry out of the refrigerant occurs in the refrigerant flow passage 2 because the heat input etc., of plasma increases, it is possible to increase speed of a compressor 7 and inhibit the dry out from occurring in the refrigerant flow passage 2. Further, if the refrigerant supplied to the refrigerant flow passage 2 is liquefied, the refrigerant supplied into the refrigerant flow passage 2 is kept in the gas-liquid two-phase state by controlling a flow rate valve 16 for heat exchange water and a temperature control water tank 17.